UK SPACE AGENCY

The future of UK Earth Observation:

Maximising the potential for economy, science and society.

Beth Greenaway
Head of EO and Climate

7th September 2018

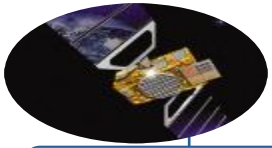
UK Space Agency

Chief Executive: Graham Turnock

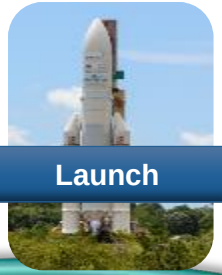
An Executive Agency of the Department of Business Energy and Industrial Strategy (BEIS)

- ✓ Civil Space Policy
- ✓ Funding e.g. €1.4 billion committed to ESA over the next 4 years
- ✓ Strategic Leadership of the sector

From world-leading science to innovative satellite technology and services, space is a fundamental part of Britain's future.

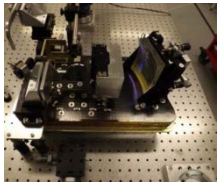


Spectrum & Licences



Launch

Operations



Development

Data & Ground Segment

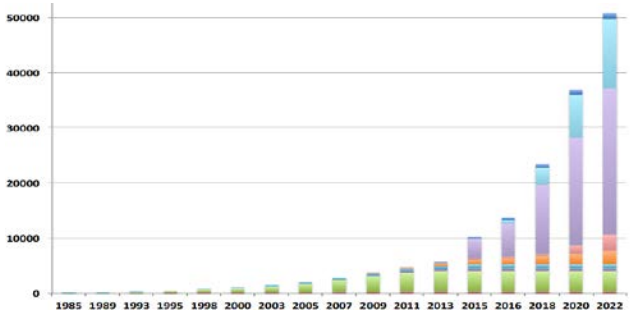
UK Space Infrastructure chain supporting Earth Observation enabled services

Research

Information & Services

What is changing?

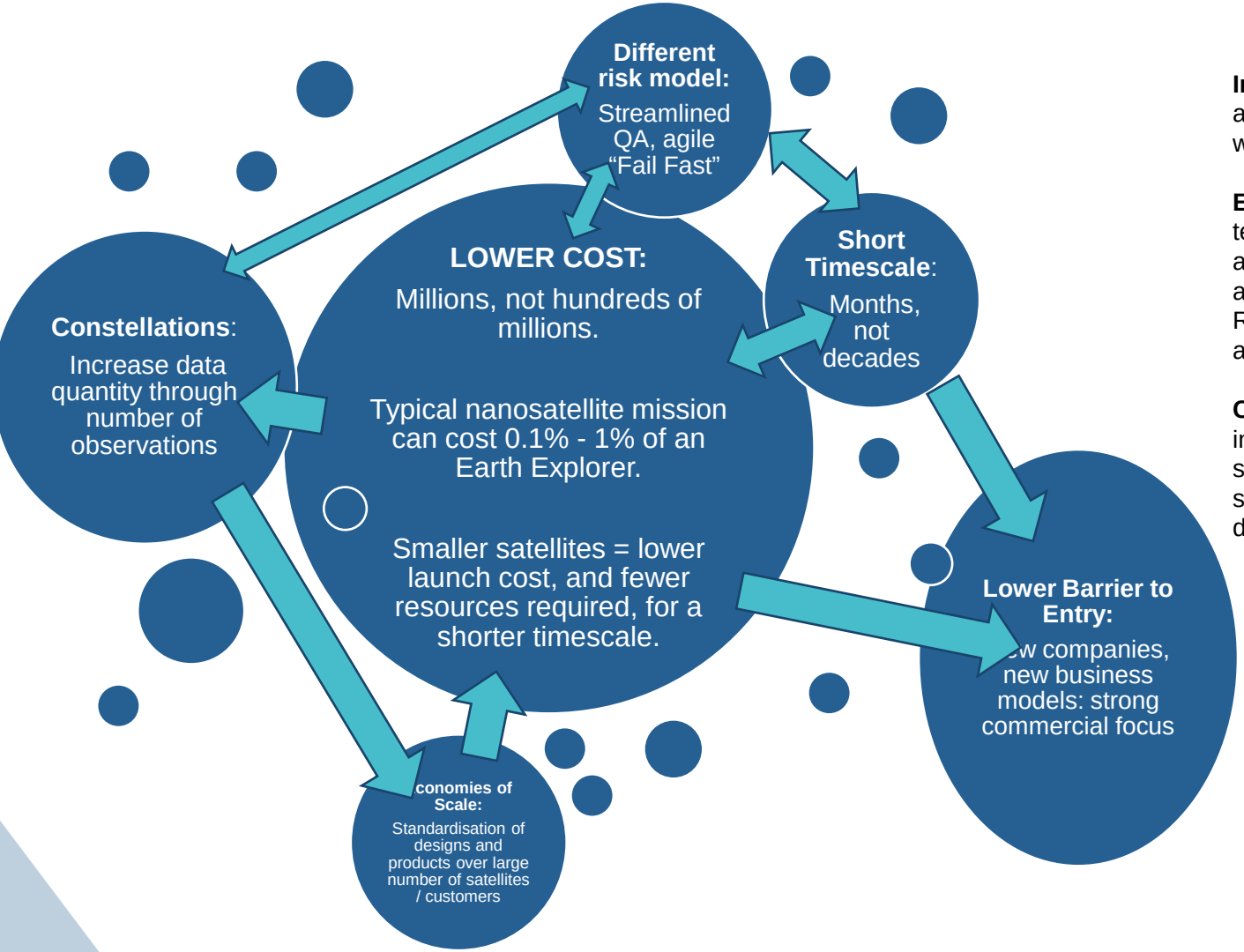
- Data – high res / high frequency / video / commercial constellations
- Digital economy IT / cloud computing / big data analytics
- Copernicus long term guaranteed operational data
- Space launch capability and UK space port
- Brexit
- New Space
- Business models



What does New Space mean for EO in the UK?

- Think piece for discussion on Webex 22nd October
- Informing UK collective thinking for ESA week

- What role should National Government Play?
- What is the role of ESA ?
- Who's the winners and are there losers – is that the future we want to create?
- What does it mean for data policies and Cal/val?
- What business models work?



Innovation: new technologies, approaches, services quickly, see what works.

Early adopters: use of new technologies (e.g. AI, nanosats, HAPS) alongside existing ones to create new approaches and business models. React quickly to new developments and update accordingly.

Commercialisation: private investment to generate commercial services – less reliance on public sector funding, less focus on dissemination of data for "public good".

What will EO look like in 2040

Missions

2000 Public

2040 Public / private

Data use and processing

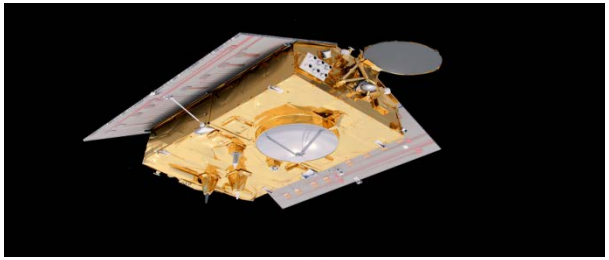
Public

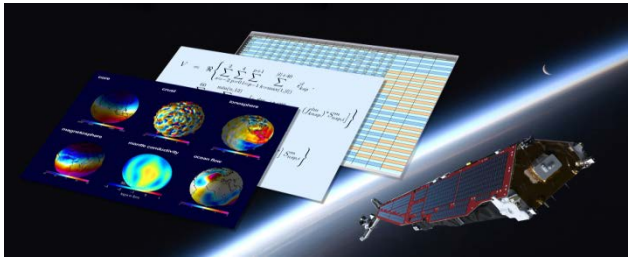
Public / private

Use

Science and Met

Mass market /public policy/ Met and science





The UKSA EO Vision 2017-2040

To ensure that the UK's participation in Earth observation is as strong as possible and that it is recognised for the role it can play in delivering a sustainable service based economy.

By 2040 satellite Earth Observations will provide the data underpinning mass market and business applications, global cutting edge science and policy and operational decision making.

Therefore ..we should exploit the fact the UK is the lead funder of EO in the European Space Agency to develop a broad and deep ecosystem of companies big and small dealing in the entire spectrum of earth observation issues from early research and technology development, through manufacture and launch, through the infrastructure and services needed to move, validate -share and interpret the data into a format suitable for use.

We should export EO skills and technologies worldwide, negotiate a new relationship with Copernicus and plug the emerging EO skills gap to fill the jobs that will be created in the UK.

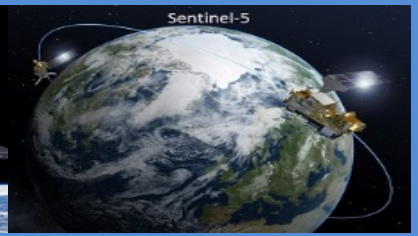
Key Priorities 2017-2021

Markets	Technology	Data		
X	X	X	1	Leveraging return from ESA - £ and positioning
X	X	X	2	Maximising the opportunities in Copernicus and EU programmes
X	X	X	3	Positioning EO as a fundamental infrastructure and tool underpinning industrial strategy, policy and societal needs
X	X	X	4	Foster global innovation and growth (applications, technology, bilateral and international partnerships etc.)
X	X	X	5	Inspiring the next generation

Thematic (Cross Cutting) Areas

- Markets
  - Climate
  - Polar and Artic
  - Sustainable Development Goals
  - Marine
- Technologies and innovation
  - EO Technology Strategy published in December 2017.
  - Quality control / Trusted/ Cal /Val activities
- Data Access and Use
  - Creating a sustainable supply via
    - Policy and regulations (CEOS and GEO data groups, ESA and Commission relationships)
    - Bilateral and commercial suppliers relationship,
  - Enabling infrastructure

Copernicus Programme



Copernicus Space Component

Copernicus Services

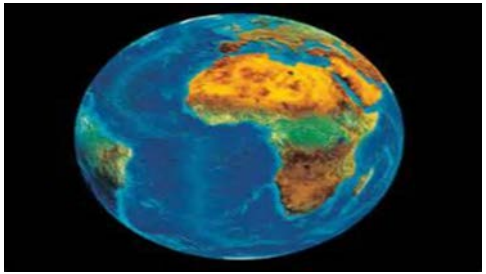
Copernicus Data

Processing & Archiving Centres

Receiving Stations

UK in ESA EO programmes

- CMIN 16 Subscription to 3 programmes >€300m Geo-return basis.
- EOEP5 - £255.8m
  - Block 1 – EE9 and EE10, mission prep
  - Block 2 – Biomass, Flex, EE9, EE10
  - Block 3 - Operations
  - Block 4 - Science and exploitation
- CCI+ - £23m
  - Hosted in Harwell Climate Office
- INCUBED – £10m Innovation in EO industry.
- Earthnet



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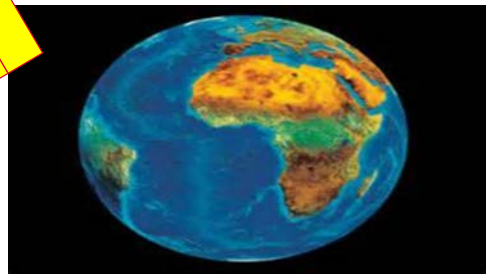
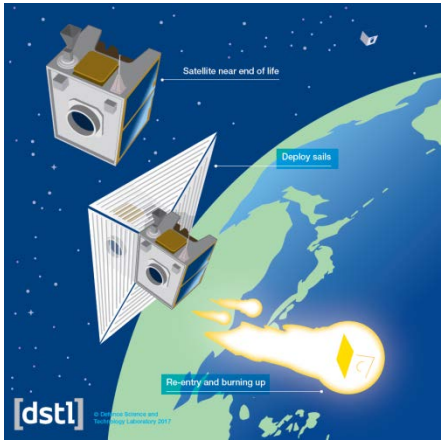
CMIN 2019- new opportunities



We Innovate: EO Technology Innovation

Call 11 closed Jan 2018
4 times over subscribed with excellent proposals

EO Technology Strategy – Published November 2017.



CompAQS Airborne Demonstrator
EO8 Flagship (Univ. Leicester, SSTL)
Quantification of air pollution (NO2 & Aerosols)

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CEOI – new calls for £4m coming

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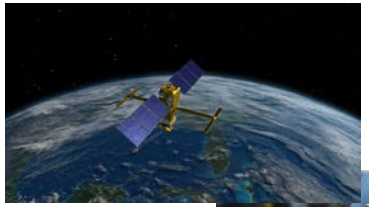
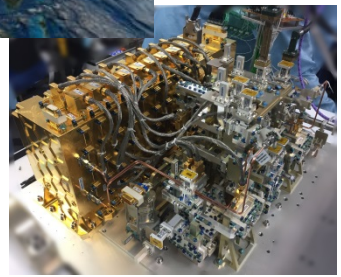
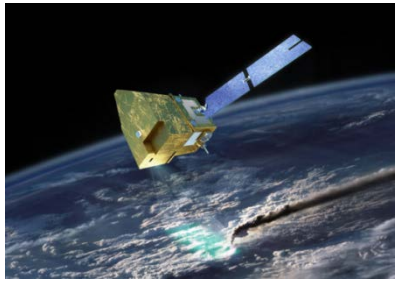
UK Space Agency EO Partnerships missions





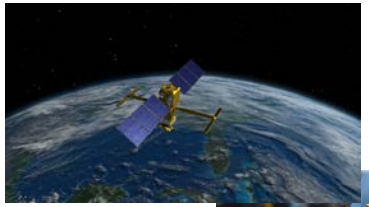
SWOT- global survey of Earth's surface water. UKSA funding development of most complex Duplexor ever for use on the satellite.

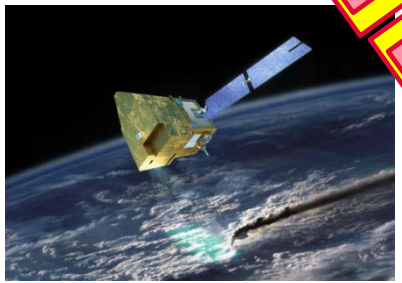
UK providing Infrared detectors for **IASI-NG.** Operational meteorology, climate monitoring, characterization of atmospheric composition related to climate, atmospheric chemistry and environment.



MICROCARB- first European satellite dedicated to Carbon. UK partnered with CNES- providing AIT for satellite, calibration and validation activities, instrument and platform subsystems and mission preparatory science.

UK Space Agency EO Part… missions





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…or **IASI-**
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EO Mission Capability Review – could UK be leading the way?

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

We connect the economy of the future.

Government

Emergency Services

Energy

Finance

Food

Water

Health

Transportation

Telecomms

We connect the economy [illegible]re.

Government

Finance

INDUSTRIAL Strategy
Sector Deal and Challenge
Funds

Food

Water

Health

Transportation

Telecomms

Working in partnerships.

Space is the best example of cooperation among European countries and beyond. We will con with partners across Europe and around the world to achieve together what couldn't be done alone.

- Working with countries as diverse as Kazakhstan and Algeria, Tanzania and the UAE
- Encouraging foreign direct investment from global space companies like Thales Alenia Space, Lockheed Martin, Deimos and ComDev.
- International Partnership Programme (IPP): a 5 year, £152 million programme using sector's research and innovation strengths to deliver a sustainable, economic or societal benefit to undeveloped nations

IPP works in 30 countries in Americas, Africa, Asia & Pacific – Where next?

70 different UK organizations (industrial and academic) 100+ overseas partners!

Space for Smarter Government

- Raising awareness
- Enabling Access
- Demo Capability

Led and funded by the UK Space Agency

Established in 2014

Delivered in close collaboration with the Satellite Applications Catapult.

Working on cross-cutting initiatives centred around Disaster Risk Management, the Emergency Services and Infrastructure

Enabler for wider export

Aims to increase the uptake of space data and services within the UK public sector to enable efficiencies

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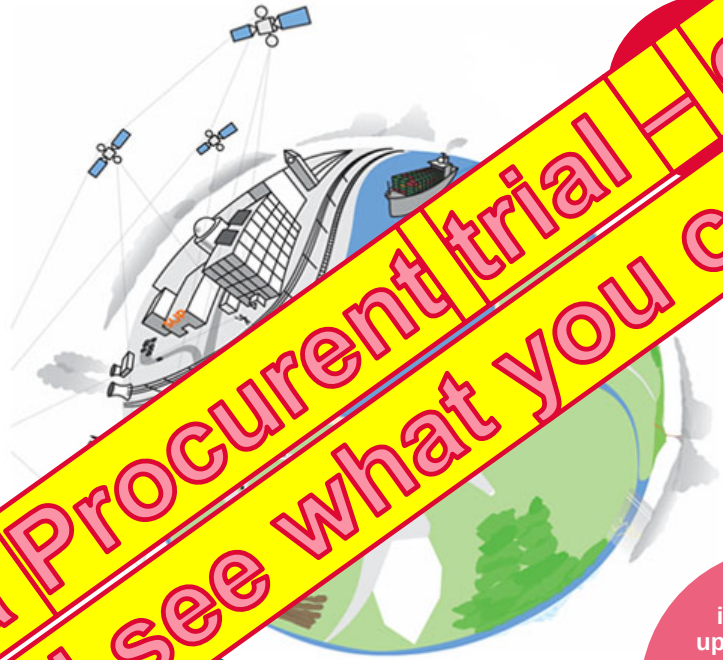

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Data Procurement trial - Come and see what you can do

SPACE4CLIMATE GROUP

A public-private-academic partnership working collaboratively to ensure a seamless supply chain for climate data from space.

We support the UK's world-leading climate community to deliver, sustain and make use of climate information from space, enabling it to be integrated "as standard" in a variety of climate services for global economic and societal benefit.

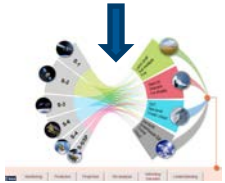
We do this by coordinating activities, expertise and resources across our partners to:

- Expand market uptake domestically and internationally,
- Sustain and grow the network,
- Support delivery of a seamless supply chain,

www.the-iea.org/space4climate

DATA SUPPLY CHAIN

Climate data from satellites, including from those in the European Space Agency programme, can be processed by UK scientists and converted into Climate Data Records. This process is supported by the JASMIN supercomputing facility.



Climate Data from Space zone on JASMIN

Provides data processing facilities, community tools and software to allow regular production of climate data from currently flying satellite instruments.

ESA CCI data portal

CEDA data archives

www.the-iea.org/space4climate

Contact us

S4C@the-iea.org

@Space4Climate

www.the-iea.org/space4climate

Visit our stand

Meet our Climate Services Development Manager:

Briony Turner

Supporting UK leadership in delivering, sustaining and making use of climate data acquired from space

Contact us

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@Space4Climate

www.the-iea.org/space4clim

Vi stand

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er:

Do you want to help unlock $12billion in Climate Services?

Supporting UK leadership in delivering, sustaining and making use of climate data acquired from space

We will create jobs and boost the economy .

- £13.7 billion to the UK economy each year
- Average of 8% growth per year over the last decade - three times faster than the average sector
- Employs 38,500+
- 6.5% share of global space economy
- Critical national infrastructure
- Underpins all other key industrial sectors

Inspire the next generation.

- Space inspires old and young in a way that few other things can.
- Tim Peake's Principia mission reached 1.6 million young people with science, technology, engineering and maths, using space to change the way they look at their world.

SPACE TO EARTH CHALLENGE

- 25 schools so far to 6,826 children.
- They have covered 25,852km in total to reach CRYOSAT satellite.
- https://youtu.be/2qGK9NuNJDs

TRIATHLON TRUST

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How should the UKSA spend an EO education budget?

TRIATHLON TRUST

SPIN Placements 2017

- Radar Wind Profiler at Sea – feasibility study for hardware concept – S&AO
- Improving sustainable agriculture in Uganda: building an Early warning platform – RheaTech
- Enabling new EO technologies for air quality markers – AVS
- Oceans as a Predictor for daily rainfall risk – Weather Logistics Ltd
- EO data preparation and analysis for machine learning – Deimos
- Prototype of EO data storage infrastructure for new nanosatellite mission – Open Cosmos
- Cinematic animation for engineering visualisation, rapid EO prototyping and client visualisation – Alba Orbital

RHEA

AVS added value solutions

Weather Logistics

deimos elecnor group

Open Cosmos

albaorbital

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SPIN 2018 announced today for EO and Space Flight projects.

RHEA

AVS added value solutions

Weather Logistics

deimos elecnor group

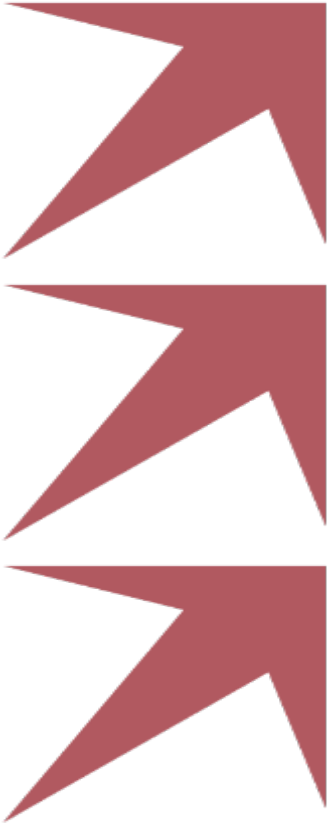
Open Cosmos

albaorbital

Finally - thanks for being part of the future

Share the good news

@spacegovuk



Essential: EO is an essential component of the infrastructure and contributor of economic growth, data and science.

Exciting: The UK has secured a lead funding position of EO in ESA and we can rightly and proudly grow the sector

Everybody: can contribute to the growth and success of EO in the UK. New opportunities are emerging all the time.

UK SPACE AGENCY

Any Questions?

Thank you